Most nearly related to *R. speciosa* Wenderoth, from which it differs in its dense retrorse pubescence, its much broader and thinner stem-leaves (practically uniform in size and shape with these of the stolons, instead of much narrower and longer as in *R. speciosa*), and its outer phyllaries which are rather densely pubescent on the inner as well as outer face. Also close to *R. speciosa* var. *Sullivantii* (Boynton & Beadle) Robinson, which however has a sparse harsh pubescence if any on the stem, thick leaves, thick blunt phyllaries scarcely pubescent on the upper side, and always apically ciliate pales.

GRAY HERBARIUM.

COLOR FORMS OF IMPATIENS BIFLORA.

C. A. WEATHERBY.

THE common jewel-weed produces an unusually interesting series of color variations. In their range of hues they are very similar to those of the garden "nasturtium" (*Tropaeolum majus* L.) and, were it worth while, could doubtless be made to develop, under cultivation, as many shades and gradations of color. Indeed, Professor Fernald tells me of one locality where, possibly through the juxtaposition and crossing of several forms, something of the sort has already happened in the wild. The forms known to the writer and described below appear, however, to represent the main lines of variation. The flowers, in the dried specimens cited, have in most cases lost all their color, but the collectors' notes give the needed information.

IMPATIENS BIFLORA Walt. Perianth orange, with more or less numerous, usually crimson spots. The typical and common form.

Forma **citrina**, f. nov. Perianthiis flavis modo *Citri Limonum* fructus, coccineo-maculatis. Perianth lemon-yellow, with crimson spots. CONNECTICUT: Moist thicket, Thompson, Sept. 7, 1908, *Bissell & Weatherby* (TYPE, in Gray Herb.).

Forma **albiflora** (Rand & Redfield), comb. nov. *I. fulva*, f. *albiflora* Rand & Redfield, Fl. Mt. Desert 88 (1894). "Flowers white or cream-color," the spots often paler than in the typical form, then pink or brownish red. MAINE: Southwest Harbor, *Rand;* Farmington, Aug. 15, 1894, *Fernald*, "white with pink spots." MASSACHUSETTS:

Edge of pool, Billerica, Aug. 12, 1911, *Weatherby*, "petals white, the spur cream-color"; Eat-fire Spring, Nantucket, Aug., 1896, *L. L. Dame*, "flowers cream-color." MINNESOTA: Tower, Aug., 1889, *E. J. Hill*, "nearly white, spotted with red." Britton (Cat. Pl. N. J. 74 (1889)) reports "a form with white flowers" at Toms River, N. J., on the authority of Dr. Knieskern.

I have not seen a pure albino form nor have I found an altogether certain, first-hand report of one. In the palest flowers seen by me, at least the saccate sepal is cream-color, the color being strongest in the spur. I am therefore leaving f. *albiflora* for the present, as defined by Rand & Redfield, to cover both cream-colored and reported white flowers. The pure albino, if it occurs, will probably prove to be a distinct strain, making, with f. *citrina* and the cream-colored element of f. *albiflora*, a series — pure yellow, pale yellow, white — such as is known to exist in *Gratiola aurea*.[1] Mr. Rand writes me as follows in regard to the type of f. *albiflora:*

"I fear that the 'forma *albiflora*' mentioned in the Mt. Desert Flora was in reality the form with cream-colored flowers. I know just where the plant grew that I had in mind, and it may grow there yet. Plants with flowers of a purer white have been observed, but I . . . did not regard them as distinct."

Forma *albiflora*, then, was founded on a plant with cream-colored flowers and the name, though inappropriate, will have to be retained for the cream-colored form, should the two strains prove distinct.

Forma **Peasei** A. H. Moore, f. nov.[2] Perianthiis roseis, rubro-maculatis. Perianth pink, spotted with deeper red. MAINE: Hartford, 1886, *Parlin*. NEW HAMPSHIRE: Damp roadside, Whitefield, Sept. 2, 1913, *A. S. Pease*, no. 14,506 (TYPE, in Herb. N. E. Bot. Club), "flowers pink"; Jefferson, Aug. 26, 1901, *Edith Cook;* Aug. 26, 1907, *A. S. Pease*, no. 10,741; Jackson, Aug. 22, 1909, *Harold St. John*, "roseate form." NEW YORK: Downsville, Delaware Co., 1891, *Miss C. G. Orton*. A specimen from Oxford, Connecticut, Sept. 10, 1903, *E. B. Harger*, no. 4344, described by the collector as having flowers "pale flesh-color to salmon-pink," may represent another strain.

In all of the above forms the spots are present, as in the typical

[1] See RHODORA, ix. 123 (1907). Cream-colored or pale yellow variants of several yellow flowers are known to occur. *Impatiens pallida*, *Potentilla pumila*, *Hypericum punctatum*, and *Rudbeckia hirta* are cases in point. In *I. pallida* an albino form has been reported by Clute.

[2] Named for Professor A. S. Pease, as a small recognition of his untiring work in the study of the flora of Coös County, New Hampshire.

form. According to collectors' notes and what I have seen myself, they vary somewhat in color, from crimson to pink and brownish red, and very much in number. In some individuals they are few and scattered and in others so numerous as to coalesce in an irregular crimson spot on the lower spreading petal. But in all these forms they exist without essential change of hue, quite independently of the variations of the body-color of the perianth. In a fifth form, however, the perianth is orange, as in the typical form, but the spots are entirely absent. Rough tests of the pigment of these spotless flowers gave different results from the same tests applied to flowers of two spotted forms, of which fresh material was available at the time. This form may be called

Forma **immaculata**, f. nov. Perianthiis aurantiacis, sine maculis. Perianth orange, without spots. MAINE: Springy woods, St. Francis, Aug. 16, 1893, *Fernald*, no. 21a (TYPE, in Herb. Gray); Bar Harbor, Aug. 31 (no year given), *Kate Furbish*. VERMONT: Mt. Mansfield, Aug., 1877, *Faxon*. MINNESOTA: Lac qui Parle (no date or collector), "without spots."

Certain facts about these forms may be worth noting. As might be expected in a species producing cleistogamous flowers, they show abundant ability to maintain themselves. Forma *Peasei* was collected at the same station in Jefferson, New Hampshire, in 1901 and 1907. Forma *albiflora* at the Billerica station, where conditions are unfavorable for its spreading, was present in about the same quantity in 1914 as when I first saw it there in 1911. Forma *citrina* at Thompson, where conditions were more favorable, increased considerably between 1908 and 1914, though the station is now likely to be exterminated by the building of a state road. That is, these forms are apparently not recurrent but unstable variations, like, for instance, *Viola pedata*, f. *rosea*,[1] but, once established, tend to remain as fixed and genetically constant lines.

At the Billerica and Thompson stations the forms occur in pure colonies, associated with, even mingled with, the typical form, but not grading into it nor into any of the other variant forms. That is, at Billerica, all the variant plants are f. *albiflora*, at Thompson, practically all f. *citrina*. At the latter place, out of scores of plants, two exceptions were noted in which the color was somewhat intermediate between f. *citrina* and typical *I. biflora*. These, however,

[1] See RHODORA, xiv. 22 (1912).

were very probably due to crossing. Many bees were at work on the flowers and appeared to visit both forms indiscriminately.[1]

The colors developed in these variants occur normally in other species of the genus. *I. racemosa* DC., *I. Dalzellii* H. f. & T., *I. repens* Moore, etc. are yellow; *I. porrecta* Wall., *I. laevigata* Wall., *I. longipes* H. f. & T. and others are cream-color; *I. capensis* Thunb., *I. modesta* Wight, and *I. diversifolia* Wall., pink. We have here, as in *Gratiola aurea*, a series of variants correlated with ancestral tendencies in the genus, and perhaps arising from the loss of elements present in the typical form.

Water-color drawings of formae *albiflora* and *citrina* have been kindly made for me by Miss Una L. Foster and are deposited in the Gray Herbarium. It is hoped to complete the series of drawings as opportunity offers to get fresh material.

EAST HARTFORD, CONNECTICUT.

[1] Both honey-bees and a small species of humble-bee visited the flowers. The honey-bees invariably plunged into them in the fashion needed for effecting pollination, pushing their way into the sac until only their "business ends" were visible. The humble-bees, on the other hand, alighted in the same position as the honey-bees, but instantly and with entire unanimity, turned over, hung upside down beneath the flower and tried to pierce the spur and extract the nectar from the outside. So far as I could judge, the swaying of the flower and the elasticity of the spur, frequently defeated this attempt. Some insect rifles the nectaries of *Habenaria blephariglottis* after the same fashion and with better success. In some dozens of spikes of this species which I examined last summer, nearly all the spurs were punctured, but I could not catch the burglar at work.